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(54) Method of forming a vehicle transmission clutch housing

(57) A clutch housing (10) for a vehicle transmission assembly and a method of making the same. The housing is generally cup-shaped with an axial hub (14). The outer wall (16) of the housing (10) is formed with a plurality of longitudinal splines (22) of varying configurations. Select splines are formed at an increased depth. A groove is formed in the exterior surface of the housing at a depth sufficient to intersect the select splines (22) of the inner surface thereby forming apertures (26) through the wall of the housing. The dimensions of the apertures (26) are determined by the configuration of the exterior groove and the interior splines (22).

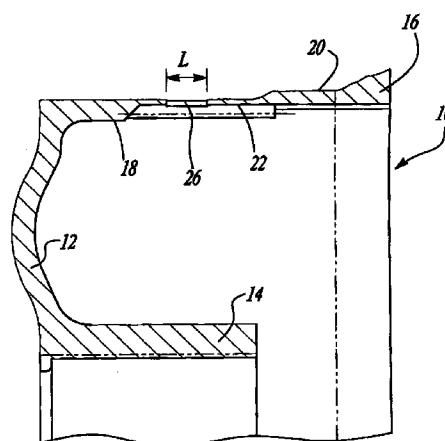


Fig. 3

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Description

Background Of The Invention

I. Field of the Invention

[0001] This invention relates to automatic transmission and transfer case clutch housings and, in particular, to a cost effective method of forming oil escape apertures and speed sensing slots in such clutch housings.

II. Description of the Prior Art

[0002] Manufacturers are continually developing more cost effective methods of developing automobile and truck components to reduce the manufacturing costs of vehicles. Metal components may be stamped flow formed from a blank and even formed from powder metal depending upon the configuration of the part.

[0003] Clutch housings for automatic transmissions and transfer cases have a generally cup-shaped configuration with an axial hub. The outer wall of the housing includes an inner surface having a plurality of longitudinal splines which determine the operation of the clutch housing in conjunction with variations in transmission fluid pressure. Typically, the clutch housing is flow formed from a blank to the desired configuration. Several machining operations are performed to form the desired configuration including punching apertures in the outer wall of the housing to create oil escape holes. This extra step requires the purchase and use of hole punch machines adding to the cost of manufacturing the clutch housing. In addition, such hole punching machines provide little flexibility in altering the position of the oil escape holes.

Summary Of The Present Invention

[0004] This invention overcomes the disadvantages of the prior known methods of manufacturing transmission clutch housings by forming oil escape holes during machining of the outside diameter of the clutch housing.

[0005] The clutch housing formed using the method of the present invention has a generally cup-shaped configuration with an axial hub. The housing is preferably flow formed to a near-net configuration from a metal preform or blank. The flow forming operation forms a plurality of splines on the inner surface of the housing outer wall. The number and configuration of the splines is determined by the desired operating characteristics of the clutch housing. However, at least one of the splines is formed at an extra depth thereby increasing the major inner diameter of the housing at predetermined intervals. Accordingly, whereas several if not a majority of the splines will be formed at an increased depth forming an increased major diameter to the inner surface of the housing. A groove is machined into the outside diameter

of the housing to a depth which will intersect the splines of increased depth thereby forming apertures through the wall of the housing. The dimensions of the oil escape apertures is determined by the width of the groove (forming the axial length of the aperture) and the width of the spline formed in the inner surface (forming the circumferential width of the aperture). Thus, the number, spacing and size of the apertures will be determined primarily by the inner splines formed in the housing and the groove machined on the outer surface of the housing. By varying these key features, oil escape holes can be formed without the need to punch through the housing or by increasing the dimensions, speed sensing slots may be provided in the outer wall of the housing.

[0006] Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description Of The Drawing

[0007] The present invention will be more fully understood by reference to the following detailed description of a preferred embodiment of the present invention when read in conjunction with the accompanying drawing, in which like reference characters refer to like parts throughout the view and in which:

FIGURE 1 is a plan view of a clutch housing formed using the method of the present invention;
FIGURE 2 is an enlarged partial view of an outside wall of the clutch housing; and
FIGURE 3 is a partial cross-sectional view taken along lines 3-3 of Fig. 1.

Detailed Description Of A Preferred Embodiment Of The Present Invention

[0008] Referring to the drawings, there is shown a clutch housing 10 adapted to be used in automatic transmissions and transfer cases for vehicles. The present invention is directed to a clutch housing 10 having a plurality of oil escape holes and/or speed sensing slots and the method of manufacturing the clutch housing 10.

[0009] The clutch housing 10 has a generally cup-shaped configuration with an end wall 12, an inner axial hub 14 and an outer wall 16. The outer wall 16 includes an interior surface 18 defining an inner diameter and an exterior surface 20 defining an outer diameter. In accordance with the operating characteristics of the clutch housing 10, a series of longitudinal splines 22 are formed in the interior surface 18 of the outer wall 16. The splines 22 may be formed at varying intervals, lengths and depths for operation in a predetermined manner. In accordance with the present invention, at least one and preferably a plurality of the splines 22 are

formed at a depth greater than the standard major inner diameter of the splines. The interval and number of splines 22 with increased depth is dependent upon the desired number of apertures through the outer wall 16 of the finished clutch housing 10. Although the selected splines 22 are formed at an increased depth, sufficient wall structure remains.

[0010] In order to form the oil escape holes, the exterior surface 20 of the outer wall 16 is machined to form a circumferential groove 24 transverse to the longitudinal splines 22. The groove 24 is machined to a depth sufficient to engage the increased depth splines 22 thereby forming an aperture 26 through the outer wall 16. The width W of the aperture 26 is determined by the width of the spline 22 while the length L of the aperture 26 is determined by the width of the circumferential groove 24. Thus, the outside diameter can be machined accordingly whether oil escape holes or speed sensing slots need to be formed in the clutch housing 10. Since these apertures do not need to be punched into the housing and the exterior of the housing must be machined anyway, the desired apertures can be formed at little or no extra cost in manufacturing. Furthermore, the size of the apertures 26 can be more precisely controlled through the machining operation as opposed to a punching operation.

[0011] The clutch housing 10 of the present invention is manufactured to form the required oil escape holes in the housing wall. In a preferred method of manufacture, the housing 10 is flow formed from a solid or preformed blank to a near-net configuration. During the flow forming operation, the splines 22 are formed in the interior surface 18 of the outer wall 16 including splines of a greater depth to eventually form the apertures 26. Thereafter, the exterior surface 20 is machined to the desired configuration including the machining of groove 24 to intersect the select splines 22. The dimensions of the groove 24 in conjunction with the dimensions of the spline 22 will determine the configuration of the apertures 26 formed through the outer wall 16 of the clutch housing 10. Accordingly, while the method still requires flow forming and machining apparatus, an apparatus for punching the apertures 26 in the housing wall 16 is no longer needed.

[0012] The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom as some modifications will be obvious to those skilled in the art without departing from the scope and spirit of the appended claims.

Claims

1. A method for forming a housing for a vehicle component comprising the steps of:

forming a housing body having an outer wall, said wall including an interior surface and an

exterior surface;

forming a plurality of longitudinal splines on said interior surface of said housing wall, at least one of said splines formed at a predetermined first depth; and
machining said exterior surface of said housing wall to remove material sufficient to engage said at least one of said splines formed at said first depth thereby forming an aperture through said outer wall.

2. The method as defined in claim 1 wherein said housing body is flow formed with said outer wall, said longitudinal splines formed on said interior surface during flow forming of said housing body.
3. The method as defined in claim 2 wherein said machining step comprises machining a circumferential groove in said exterior surface transverse to said longitudinal splines, said groove formed at a predetermined second depth to intersect said at least one spline formed at said first depth thereby forming said aperture.
4. The method as defined in claim 3 wherein said aperture has dimensions corresponding to a width of said machined groove and a width of said at least one longitudinal spline.
5. The method as defined in claim 4 wherein the number of apertures formed in said outer wall of said housing corresponds to the number of splines formed at said first depth.
6. The method as defined in claim 2 wherein said housing body has an end wall integral with said outer wall and an axial hub integrally formed with said end wall.
7. The method as defined in claim 6 wherein said housing is a clutch housing for use in vehicle transmission assemblies.
8. A method for forming a clutch housing adapted to be used in a vehicle transmission comprising the steps of:

forming an integral housing body having an outer wall, an end wall and an axial hub, said outer wall including an interior surface and an exterior surface;
forming a plurality of longitudinal splines in said interior surface of said housing outer wall, at least one of said splines formed at a predetermined first depth greater than the depth of the remaining splines; and
machining a circumferential groove in said exterior surface of said outer wall transverse to

said longitudinal splines, said circumferential groove machined to a predetermined depth sufficient to intersect said at least one spline formed at a predetermined first depth thereby forming an aperture through said outer wall.

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9. The method as defined in claim 8 wherein said housing body is flow formed, said longitudinal splines formed on said interior surface during flow forming of said housing body.

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10. The method as defined in claim 9 wherein said at least one aperture in said outer wall has dimensions corresponding to a width of said machined groove and a width of said at least one longitudinal spline.

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11. A clutch housing adapted to be used in a vehicle transmission, said clutch housing comprising:

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a housing body having an outer wall, an end wall and an axial hub, said outer wall including an exterior surface and an interior surface having a plurality of longitudinal splines formed therein, at least one of said longitudinal splines having a predetermined first depth greater than the depth of the remaining splines.

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said exterior surface of said outer wall including a circumferential groove transverse to said longitudinal splines, said circumferential groove having a predetermined depth sufficient to intersect said at least one spline formed at said predetermined first depth thereby forming at least one aperture through said outer wall.

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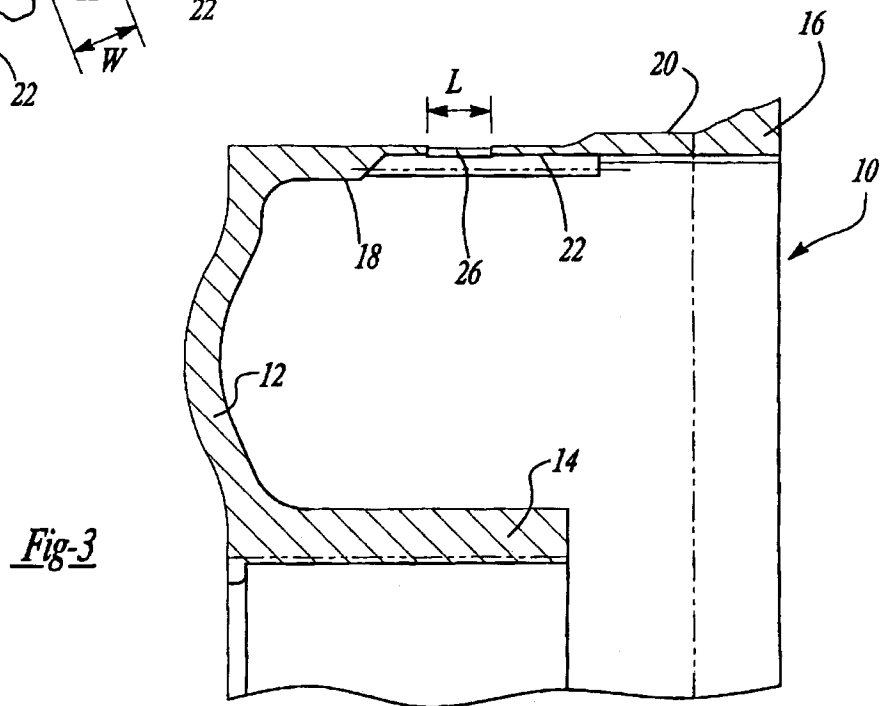
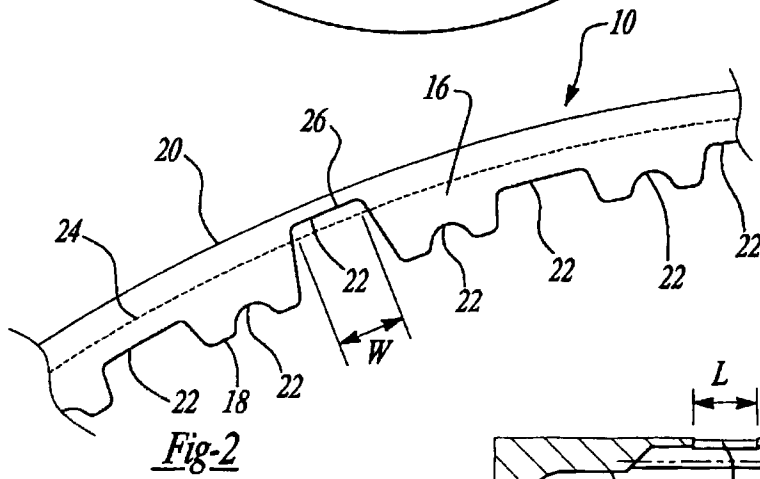
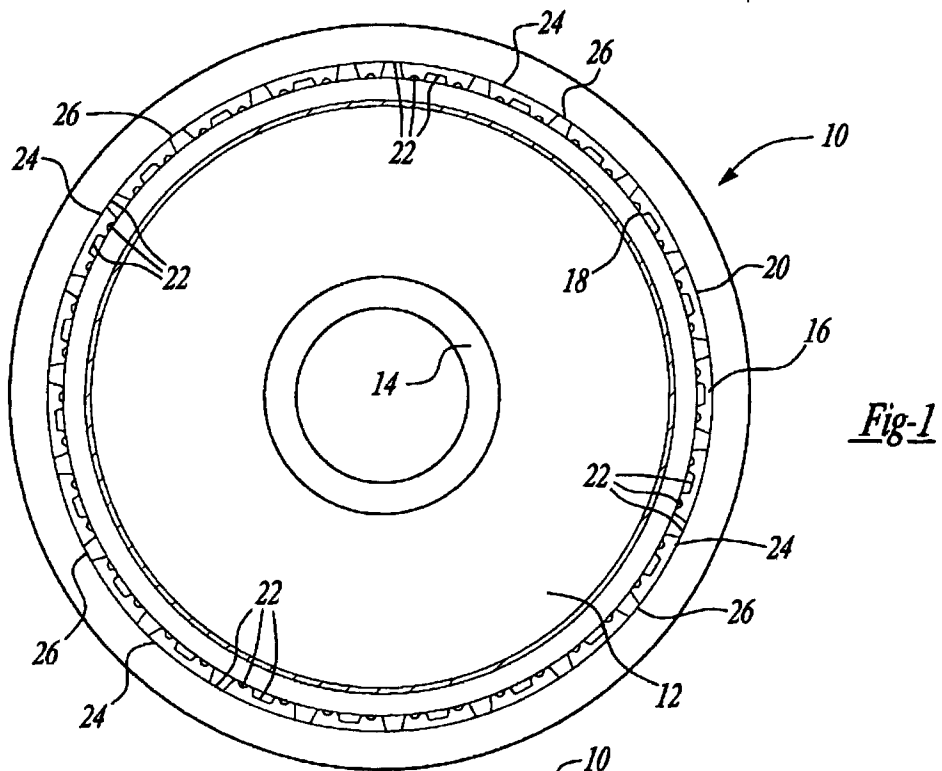
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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 8259

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 097, no. 007, 31 July 1997 -& JP 09 089005 A (MAZDA MOTOR CORP), 31 March 1997 * abstract; figures *	1,2,8,9, 11	B23P13/02 F16D13/52 F16D25/12 F16D13/74
A	US 4 014 619 A (GOOD WILLIAM K ET AL) 29 March 1977 * column 1, line 61 - column 2, line 68; figures *	1,8,11	
A	US 5 078 536 A (ANDERSON CARL) 7 January 1992 * claims; figures *	1,8,11	
A	US 4 566 571 A (FUJIOKA KAZUYOSHI) 28 January 1986 * claims; figures *	1,8,11	
A	US 4 028 922 A (KILLOP JAMES THOMAS) 14 June 1977 * abstract; figures * * column 4, line 67 - column 5, line 9 *	1,8,11	
A	GB 2 167 537 A (CARUSO ANTHONY MARIO) 29 May 1986		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 January 1999	Examiner Plastiras, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 10 8259

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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07-01-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4014619 A	29-03-1977	AU 1324476 A	27-10-1977
		CA 1066526 A	20-11-1979
		DE 2619479 A	31-03-1977
		FR 2325838 A	22-04-1977
		GB 1527810 A	11-10-1978
		JP 1186700 C	20-01-1984
		JP 52041750 A	31-03-1977
		JP 58018528 B	13-04-1983
		US 4089097 A	16-05-1978
US 5078536 A	07-01-1992	US 4819468 A	11-04-1989
		US 5069575 A	03-12-1991
		CA 1326147 A	18-01-1994
		US 4882926 A	28-11-1989
		US 4891962 A	09-01-1990
		US 4956986 A	18-09-1991
US 4566571 A	28-01-1986	JP 59159427 A	10-09-1984
		DE 3405781 A	06-09-1984
US 4028922 A	14-06-1977	CA 1064239 A	16-10-1979
		CA 1067683 A	11-12-1979
		DE 2735960 A	20-04-1978
		DE 2759979 C	16-07-1987
		FR 2367551 A	12-05-1978
		GB 1591172 A	17-06-1981
		JP 1091524 C	31-03-1982
		JP 53055453 A	19-05-1978
		JP 56037013 B	28-08-1981
GB 2167537 A	29-05-1986	BE 901122 A	15-03-1985
		DE 3443330 A	28-05-1986
		FR 2573194 A	16-05-1986
		LU 85645 A	04-06-1985
		NL 8403593 A, B,	16-06-1986